

PANORAMIC STEREO VIEWER

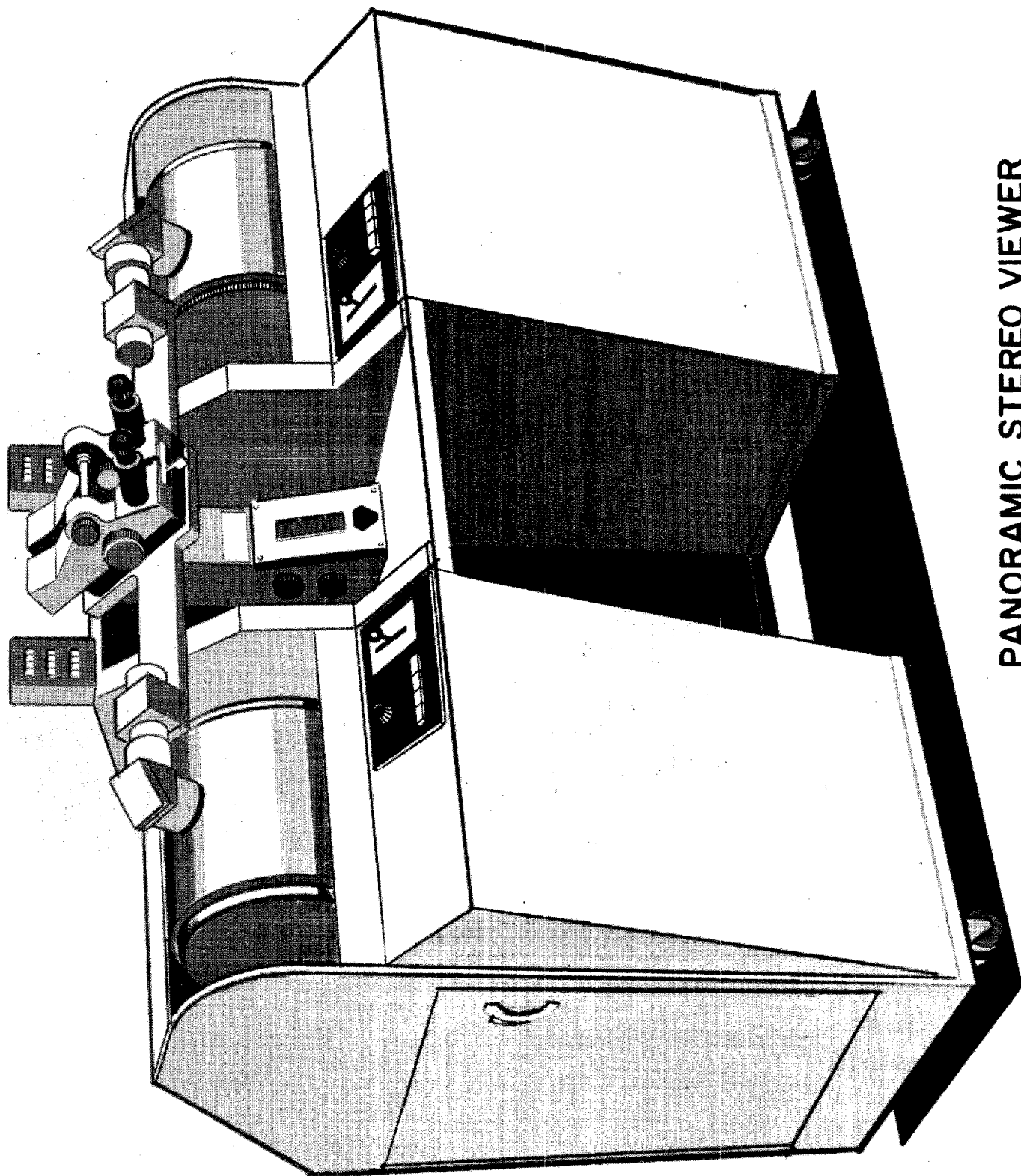
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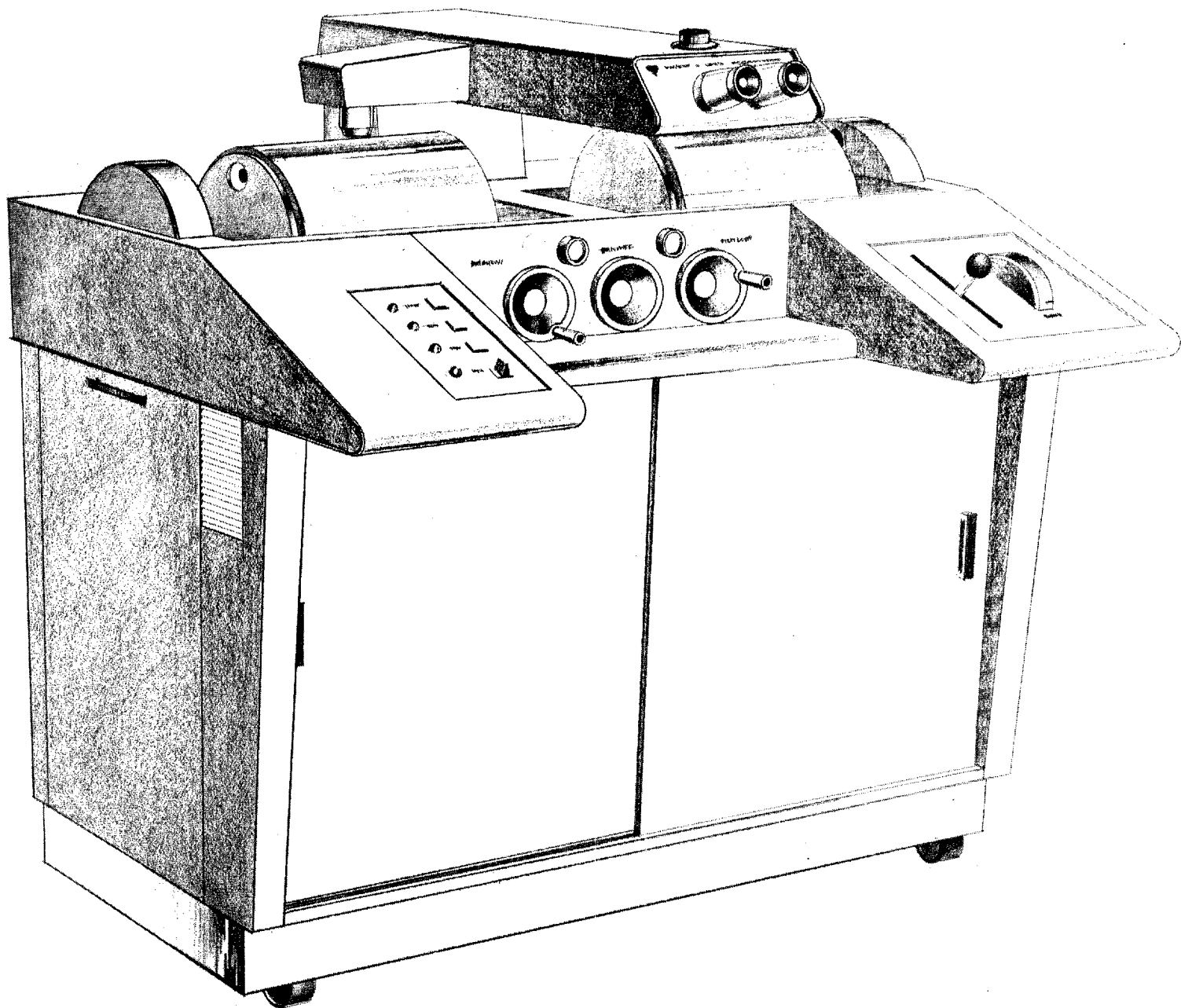
DECLASS REVIEW by NIMA/DOD

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PANORAMIC STEREO VIEWER





Artist's Concept

Panoramic Stereo Viewer

1. Introduction

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- 1.1 Proposal - [REDACTED] proposes to enter into a program of study, design and manufacture to develop a prototype of a stereoviewer that is uniquely suited to panoramic type photography. The design objectives for the viewer are set forth below.

- 1.2 Capabilities - For many years [REDACTED] has been a pioneer in the development of roll film Stereo Viewers. Notable among the instruments developed are the Single Power, Tri Power and Six Power or [REDACTED] Zoom 70 and 5" roll film viewers. These instruments provide stereo viewing of the overlap area on any film width from 70mm to 9-1/2 inches and with any conventional image orientation.

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2. Statement of Problem

- 2.1 Operational Characteristics - The proposed Panoramic Stereo Viewer will present the imagery carried on two duplicate copies of original or transformed original photography. Synchronized or separate motor driven film transport mechanisms will transport the film in either the forward or reverse directions at operator-controlled, variable speed. The optical system will contain adjustments to allow the two fields of view to be placed over corresponding image detail anywhere within the width of the frame. Longitudinal adjustment is accomplished by advancing one film with respect to the other.

- 2.2 Problem Areas - A difficult area of design is expected in providing an apparent flat field of view over cylinder stages. Optical field flatteners can accommodate some cylindrical curvature of the object material. The problem will be resolved by a study of the practical limits imposed by both optical and mechanical considerations.

Panoramic photography (not transformed) containing stereo overlap will provide true stereo viewing on a line through the field of view; the stereo perception degrades as the center of attention recedes from the line. The complex pattern of scale changes over the format accounts for this phenomenon and dictates that fine adjustment features be incorporated into each of the variable elements to allow satisfactory operation. Factors which contribute to the definition and orientation of the line of true stereo vision include, but are not limited to: location of the field of view within the format, image motion compensation, deviation of the aircraft from the ideal photo station location and orientation, viewing magnification and image quality.

The problem is to provide a viewing instrument capable of accommodating all the variables involved, to provide the operator with the proper information for stereo viewing and to provide the operator with easy access to each of the required adjustments.

3. Equipment

- 3.1 General Description - The instrument is expected to be a floor mounted console occupying approximately a 50 x 30 inch area and will be about 45 inches high. The weight is estimated as about 650 pounds. The base section will be made up of two sections with knee space somewhat resembling an office desk. Dual viewing areas will be located one on either side of the knee space. An optical viewing system will mount over the stages with the eyepieces located in the central area.
- 3.2 Frame and Skin - The console section will be fabricated of suitable structural members to provide a rigid instrument support. A sheet metal skin will cover the exposed portions of the framework for equipment and operator safety and to provide a pleasing unitized appearance. Access doors will be provided for ease of operation and maintenance.
- 3.3 Film Transports - Each console leg will contain a motor driven film transport system capable of accepting film up to 9-1/2 inches wide on spools up to 10-1/2 inches in diameter. Each system will drive the film at operator-controlled variable speeds up to 200 feet per minute. The film drives can be operated independently or synchronized. Minimum film damage is assured since the film will touch no stationary parts during any phase of operation; further, the emulsion side touches no part at any time. A non-linear,

joystick type control will provide delicate control at slow speeds while compressing the higher speed ranges.

Provisions for holding the full spools, while loading and unloading, will be provided. Full film spools may weigh as much as 70 pounds and serious damage could be caused if one of the spools were dropped during the manual cycle of loading. Operator convenience during this loading cycle will be a major consideration.

- 3.4 Viewing Stages - Two complimentary identical transilluminated viewing stages will be mounted one on either side of the instrument. Cylindrical stages of a transparent or translucent material will be used if practical. Inherent advantages of a cylindrical stage become apparent when one considers film flatness. With the cylinder the film will wrap around the periphery and assume a completely predictable location without pressure plates or other devices touching the emulsion. The large contact area created by the wrapping provides a positive force to rotate the cylinder with the film and preclude scratching of the film back. Dirt will not settle on the cylinder and remain in position by gravity alone. Anti-static devices can be incorporated to further assure cleanliness.

The stages will be mounted to slide along the axis of rotation, parallel to the instrument front, for transverse film scan and/or to adjust for stereo separation. Optical system flexibility

is also available to supplement this motion. A more complete study of the operational characteristics involved and certain design aspects will be required before assigning the final adjustment facilities to specific areas.

- 3.5 Illumination - Each stage area will have a light source associated with it. The films will be illuminated from inside the stage with sufficient intensity for interpretation of details in dense areas of photography. A photo area of 2.0 density is considered the design limit in this respect. The intensity of the light sources will be independently variable. Further study will be required to determine whether it will be necessary to use a variable concentration type light source to enhance interpretability at the high magnification and extreme image density situations.

The films will be protected from excessive heating in the focal area by means of selective filters and reflectors.

STATINTL [REDACTED] mirrors and other similar selective filters permit the separation of light into two general categories, visible and infrared. Once the separation has been accomplished, the infrared energy can be directed to heat sinks and dissipated without damage to the films. However, some heat energy is transferred to the film in any case. A 25°F rise over an 80°F ambient temperature is an acceptable limit and will be a design goal.

3.6 Optical Viewing System - A variable magnification binocular optical system with adjustable field location will be mounted above the console base with one of the optical trains associated with each stage area. The two trains will be complimentary identical halves of the binocular system. It will be possible to adjust the magnifications separately or the two sides may be coupled for synchronized changes. Non-linear motion, an inherent characteristic of variable magnification systems, dictates that the two sides must be set at a common magnification for coupled operation.

Either of two types of optical systems may be incorporated into the Panoramic Viewer. Unfortunately, the differences in the two defy combining the better features of each into an ideal system. The first system operates from 2-1/2x to 25x magnification while the second operates 10x to 100x. The operational parameters of the two systems are compatible to the point that operational preference becomes the only factor determining the choice. Other characteristics of either optical system are:

Field of View - Circular, 5-1/2 inches divided by the magnification.

Resolution - A design goal of 6 lines per mm per power of magnification.

magnification
3 1/2 - 8x 16x lenses 3 to 1 zoom

Interocular adjustment - Accommodate observers with interpupillary separations from 55 to 72mm.

Separate Eyepiece Focus - Each eyepiece is capable of focusing through the range +4 to -4 diopters independently.

Image Rotation - Each optical path contains an element allowing an independent 360° image rotation.

Field Locations - Each optical train shall contain an adjustable element to accommodate images located $\pm 4\frac{1}{2}$ inches from a nominal film center-line position.

Relative Stereo Model Distance - The apparent stereo model can be located, by the operator, at any point in space from infinity to less than 1 meter.

Working Distance - Either system maintains a constant working distance of approximately four inches. The final distance will be defined by detail design characteristics.

4. Summary

The viewer described in this proposal would present photographic images for operator study regardless of the film size or format. Stereo viewing would be possible wherever the images contain similar photo data recorded

at two separated camera stations. The stereo overlap may be conventional end overlap or the more unconventional side overlap. The photographic scales need not be the same for stereo viewing and the distance between the halves of a stereo pair does not affect the viewing capability.

The proposed instrument may be used with normal vertical, oblique, panoramic or transformed panoramic stereo photography of similar or different photo scales. A truly versatile viewing instrument.

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